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Information Asymmetry and Performance Tilting in Hospitals: A National Empirical Study

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Objective: To test the performance tilting hypothesis using information asymmetry (IA) within the community oriented activities of prospective payment system (PPS) hospitals.

Data Sources: American Hospital Association (AHA) Annual Survey Database and Medicare Cost Report from the Centers for Medicare and Medicaid Services both in fiscal year 2000; Health maintenance organization (HMO) penetration from the Area Resource File.

Study Design: A cross-sectional analysis was performed, using a national sample of 3,162 PPS hospitals merged from the AHA data set and Medicare profit data. The individual hospital serves as the unit of empirical analysis. General linear model, multiple and logistic regressions are utilized to examine the association between IA and hospital performance indicators.

Principal Findings: A positive relationship between IA and Medicare profit margins was found. Higher IA was associated with decreased likelihood that the hospital would report having a long-term plan for the health of its host community, and with increased likelihood of performance tilting.

Conclusion: Information asymmetry offers hospitals an advantageous position in achieving profit maximization. The study also documented the presence of performance tilting by health care management. Whether increased information demands from a society accustomed to significant disclosure will reduce this agency problem is not yet clear.

Author Keywords: Information asymmetry; Asymmetric information; Community orientation; Performance tilting; Medicare profit margin

INTRODUCTION

Information Asymmetry in Health Care

Markets for health care services contain significant degrees of asymmetric information and agency relationships (Arrow, 1963; Culyer, 1989; Labelle et al., 1994; Mooney, 1994). One important source of imperfect information is the asymmetry of information that exists between the consumer–user of health care (the patient) and the provider–supplier of that care (the physician or hospital) (O'Neill and Largey, 1998). This asymmetry relates to the user's inability to accurately assess need for care, or what would constitute appropriate provision for that need relative to the provider. Such asymmetry can give rise to an agency relationship between the provider and purchaser of care where the former acts as the latter's agent in determining what the purchaser's demand would be. A failed agency relationship exists when the agent (the health care provider) fails to identify patient's demands and provide care that reflects the patient's interests.

Information asymmetry (IA) is sometimes referred to as information inequality, or incomplete, or imperfect information. WHO (World Health Organization, 2001) defined it as the difference in the amount of information available to the various parties to a transaction which does not place them on equal footing to strike a deal. Derived from several additional definitions (Evans, 1984; Nyathi, 2002; WebFinance, 2003), information asymmetry in this paper is conceptually defined as a phenomenon in which the amount of relative information with regard to health service quality, demand, and cost is unevenly distributed between health care provider and consumer. Three principal types of health and health care related information are asymmetrically distributed among the three principal parties, providers, insurers and potential patients. They consist of price (provider's cost) information asymmetry (De Fraja, 2000), quality

information asymmetry (Jin, 2002; Jin, 2003; Azoulay-Schwartz et al., 2004), and demand information asymmetry (Evans, 1984; O'Neill and Largey, 1998; Chou, 2002).

Pervasive asymmetry of information exists between providers and users of health care as a commodity (Akerlof et al., 2001), in terms of the paradigms of behavioral analysis appropriate to its study, as well as the institutional characteristics which surround its development and delivery. Also, an environment that is technically complex, surrounded by much uncertainty, and which contains information asymmetry enhances the mystique of the medical professional and often leaves the user confused and perplexed (McKee and Healy, 2000).

Nichols (1998) provided three examples of asymmetries as they pertain to health care: between enrollees and insurers, between providers and insurers, and between providers and patients. Based on Nichols's (1998) and Mooney's (1994) theories and other similar research findings, a hypothetical model of the interactions involved with the three main participants in the health services market, as well as the relative distributions of information between those participants, is visualized in Figure 1. In the pictorial model, the head of an arrow indicates the side where most of the information tends to reside and the tail of an arrow indicates comparatively low related information. For instance, providers tend to withhold service quality and cost information without ascertaining patients' demands due to high transaction costs. Further, the model implies that asymmetric information distributions among the three participants of health care services place health service providers in an advantageous position, while putting patients and insurers at a disadvantage. Purchasers of insurance are also unable to ascertain whether the prices charged by insurers for their service (risk re-allocation) are fair. Further, insurers use their market power to extract significant discounts from providers.

Impacts of Information Asymmetry

Effects of information asymmetry in health care include adverse selection (Basu and Chau, 1999; Frank et al., 2000; Constantiou and Courcoubetis, 2001), moral hazard (Mocan, 2001), market failure (The World Bank Group, 2004), decreased quality of care (Hirth, 1999; Fishman and Simhon, 2000; Albrecht et al., 2002; Chou, 2002), increased utilization (Labelle et al., 1994; Grytten and Sorensen, 2001; Chou, 2002), and organizational structure change (Hennessy, 1996; Competition Commission, 2000; Tropeano, 2001). The present paper focuses on profit margin and performance tilting; rationales are discussed below.

Asymmetric information may cause increased prices of health services (De Fraja, 2000), because it can bestow market power on the holder of superior information and permit the charging of monopoly prices. Symmetry of information between market participants is a component of efficient market prices. As information asymmetries increase, more consumers determine that they are being overcharged, increasing the loss of social benefits (Clemons and Thatcher, 1997). Evidence suggests that when product quality is unobservable (quality information asymmetry exists) before purchase, the equilibrium price may be inefficiently high in order to signal high quality. For example, nonprofit organizations can credibly charge lower prices than for-profit organizations (Chillemi and Gui, 1991). Further detracting from the information value of price, when the fraction of informed consumers in the market increases, the high-price/low-quality firm type exploits the uninformed by mimicking the high-quality firm's price, while providing low quality (Albrecht et al., 2002). In another article, McLaren (McLaren, 1999) argued that most forms of advertising, to some degree, rely on information asymmetry. HMOs have been found to reduce the amount of quality information they disclose in competitive markets (Jin, 2003), suggesting that they perceive advantage in information asymmetry. A theoretical and empirical link among a response to incomplete information and agency problems,

competition, and ownership had been established for hospital markets (Dranove and White, 1994), for which some support is noted (Ellis and McGuire, 1996).

Community Orientation and Hospitals

The Declaration of Alma-Ata of the 1978 International Conference on Primary Health Care concluded that people throughout the world had very little control over their own health care and that emphasis should be placed on attaining health through a response from the community to their health problems (World Health Organization, 2003). Fourteen states have passed laws, regulations, or guidelines that related to community benefits, which non-profit hospitals are required to document in return for their tax-exempt status (The Access Project, 2005). Some evidence exists that American community hospitals do undertake to reflect community interests, as well as organizational interests, in their planning. Defining community orientation as the generation, dissemination, and use of information regarding the service area (Proenca et al., 2000), Proenca and colleagues conclude that American hospitals have become more community-oriented as a strategic response to environmental pressures. However, health care providers may still have some level of market power with which to assert their influence on both consumer demand and health service utilization.

Managerial Myopia and Performance Tilting

Myopic behavior refers to forces that lead firms to adopt short-term perspectives; performance tilting, a subject of the present paper, is the intentional favoring of one goal over another. Both may occur when information is imperfectly distributed. Chemmanur and Ravid (1998) developed a model of corporate myopia in which the interaction between asymmetric information and short-term trading by equity holders induces firms to undertake short-term efforts, rather than long-term projects that are intrinsically more valuable. Moreover, managers

might often be criticized for paying too much attention to a short-term plan when asymmetries in information between shareholder and manager exist (Zeckhauser and Pound, 1990). Other sources of corporate myopia, identified in the accounting, finance, and management literature, include ownership, executive tenure, decision-making horizons, multi-tasking, and compensation schemes and incentives (Holmstrom and Milgrom, 1991; Beldona, 1995; Lambert, 2001; Eggleston, 2005).

Empirical results suggest that hospital managements may also exhibit myopic behavior, favoring a short-term over a long-term goal. Assessment of community health needs, important for projecting future products, has been found to be less common among for-profit hospitals (Becker and Potter, 2002). Similarly, hospitals with strong out-of-state ties were less likely to report quality and/or cost data to their local communities (Becker and Potter, 2002). In each case, the authors conclude that responsible behaviors are lessened by the profit motive and lack of strong local affiliations.

The concept of performance tilting (Zeckhauser and Pound, 1990) is also relevant to analysis of the management of healthcare institutions. When asymmetries in information between shareholder and manager exist, a manager or provider intent on demonstrating that he is performing ably will tilt performance by fostering A, an immediate measurable outcome, at the expense of B, a more long-term goal. For example, A might be income; B might be employee training. Performance tilting by management, as well as information asymmetry, may reduce the efficiency and effectiveness of the health services market.

Competitive markets, explicit performance measures, and incentive compensation are hypothesized sources of tilting in industry (Grossman and Hoskisson, 1998; Madorran Garcia and de Val Pardo, 2004). A key question is whether performance tilting is present in the largely

non-profit hospital sector. The nature of Chief Executive Officer (CEO) position suggests motivation for performance tilting. A survey of hospital CEOs found that the evaluation criteria most frequently reported used in assessing their performance was “allocating financial, physical, and human resources” (93%) (American College of Healthcare Executives, 2002). For nearly all CEOs, performance assessment was reflected in their salary and/or bonus (92%); empirical evidence suggests that poor financial performance is associated with CEO turnover (Eldenburg et al., 2004). Hospital CEO turnover is significant, averaging 14.6% across the 2001-2005 period (Evans, 2006). The median tenure of a hospital CEO is 3.6 years, and between a third and a half of CEO turnover is involuntary (Khaliq et al., 2006). Developing a long-term plan for community health entails working with community agencies responsible for health data, collaborating with other providers, meeting with consumers, and other time-consuming activities that offer no immediate return, although these activities may build brand recognition and community goodwill. Facing the tension between long-term strategy and annual evaluation criteria tied to financial performance, and recognizing the possibility of forced departure, a CEO may focus on maximizing short-term profitability at the expense of a long-term plan for community health.

Summary

Information asymmetry exists in the provision of health care because of idiosyncrasies in the health care system. Under the uncertainty condition, in which information search is costly, patients, who have difficulty obtaining health service quality and cost information, are in a disadvantageous position. Uninformed patients have to rely on delegating health services to health care providers as their (imperfect) agents. In delivering health care, hospitals may hold or

conceal their quality and cost information and may not collect and communicate clinical and health information to specify what would constitute appropriate provision for need of care relative to patients, because information sharing and acquisition is a transaction cost in which some hospitals may not choose to invest. Thus, it is likely that information asymmetry provides hospitals with an informational advantage over the consumer and market power to direct the health service and to raise the hospital income by internal management. Because asymmetric information leaves open the possibility of the profit-maximizing (exploitative) provider behavior (Newhouse, 1988; Challen, 2000; Ernst, 2003; Azoulay-Schwartz et al., 2004), the effects of information asymmetry in health care can be observed in higher profit, lack of a long-term plan of improving community health, and performance tilting.

Purpose of the Study

Few previous studies have empirically explored the effects of information asymmetry on hospital performance using national data. The goal of the present study is to identify the relationships between information asymmetry and three important aspects of hospital management: hospital profitability, the generation of a long term plans for improving community health, and performance tilting. The first two aspects are linked to agency theory and transactional cost analysis, and the third to the performance tilting hypothesis. The purposes of this study are:

1. To explore the components, structure, and magnitude of information asymmetry between hospitals and their communities.

2. To differentiate hospitals with high information asymmetry from hospitals with low information asymmetry, and then:

3. To identify the effect of information asymmetry on hospitals' profitability,

4. To specify the relationship between information asymmetry and long-term plan for improving community health, and finally and principally,

5. To examine the relationship between information asymmetry and performance tilting in hospitals nationwide.

METHOD

Hypotheses and Research Design

It is hypothesized that, after controlling for the effects of relevant hospital and market characteristics, when information asymmetry increases, Medicare profit margins of the hospitals will increase, and the likelihood that a hospital will display performance tilting will also increase. These hypotheses are tested in a cross sectional design, analyzing hospital performance data from Fiscal Year 2000.

Data Set

Data are drawn from three sources: the Annual Survey Database (ASDB) - Fiscal Year 2000 from the American Hospital Association (AHA), the Area Resource File (ARF) from the Health Resources and Services Administration, and the Inpatient Medicare Profit Margins (IMPM) - Fiscal Year 2000 from the Centers for Medicare and Medicaid Services (CMS), which are derived from the Hospital Cost Report (CMS-2552-96) of the Healthcare Provider Cost Reporting Information System (HCRIS).

Hospitals that do not participate in the Medicare, including long-term care, rehabilitation, children, psychiatric, and rural critical access hospitals, were excluded from the analysis, as profit margins are not calculated for such facilities. After excluding non-PPS hospitals, 4,631 sample hospitals with IMPM information were retained in the study data base. The 4,631 IMPM

hospitals were then merged with the ASDB. Data merge was based on several distinguishing data fields. The matching process was successful for 3,162 hospitals, which corresponds to 68.28% of the IMPM hospital population and is large enough to represent its universe. The unit of analysis is the individual hospital of the United States. The universe of the study is all IMPM hospitals in the US.

Dependent variables

Reflecting the existing literature (Marlin et al., 1999; Stensland et al., 2002; Younis and Forgione, 2005), the current study uses Medicare profit margin as the principal dependent variable for hospital profitability. Medicare is the single largest purchaser of hospital services and accounted for 34 percent of weighted national discharges in 1998 and 37 percent in 2005 (Department of Health and Human Services, 2002; Agency for Healthcare Research and Quality, 2005). The reliability and validity of Medicare profit margin had been assessed, and the measure characterizes Medicare's contribution to hospital financial position (Ehreth, 1994). Under PPS, all Medicare inpatient providers must submit uniform cost reports, assuring that profit data will be comparable across all participating hospitals. The research adopts the definition of Medicare profit margins from the Medicare Payment Advisory Commission (MedPAC) to compute the margins. MedPAC computes Medicare profit margins by subtracting total reimbursable Medicare costs from total Medicare revenue, and then dividing that difference by total Medicare revenue (Cowles and Muse, 2003). This variable acts as a proxy for the overall profit orientation of a health care provider, because it is both readily available and calculated using uniform methods. Medicare profit margin is a continuous variable.

Long-term plan was defined as the presence or absence of a long-term plan for community health within the hospital. Hospitals have been urged to make a long-term

community commitment in the face of short-term trend and opportunities (Seay, 2005), which could be caused by information asymmetry and cost containment. Several recent studies have emphasized on the importance of a hospital's long-term plan and its predictable contribution to the community health (Fielding et al., 1999; Ghali, 2004; Ito, 2004). To measure whether a hospital has a long-term plan for improving the health of its community, the study uses self-reported hospital responses to the AHA survey (question D.2). Presence of a long-term plan is a nominal variable, coded dichotomously.

Performance tilting implies that one goal will be sacrificed in order to meet another, and thus must be studied using a combination of outcomes. Specifically, the study hypothesizes that hospital administrators will sacrifice having a long term plan that addresses community health in order to generate immediate profits for the hospital. A new variable, performance tilting, was created by combining Medicare profit margin and long-term plan for individual hospitals. Additional sensitivity and specificity estimations had been conducted to construct a link between high short-term profitability and the absence of a long-term plan. Performance tilting is coded as being present (1) if a hospital has Medicare profit margin that is higher than or equal to 75 percentile and no long-term plan; Absent (0), otherwise.

Independent variable

Because information asymmetry is not directly observable, empiricists must rely on proxy variables (Frech and Wooley, 1989; Clarke and Shastri, 2000). At present there is no widely agreed upon proxy measure for information asymmetry between hospital and patient. To approximate an information asymmetry measure, this research uses the answers to five questions under the Community Orientation section within the 2000 AHA Annual Survey Health Form, which relates to reported sharing of quality, demand, or cost information.

Why could selected answers on the Community Orientation section be adopted as proxy measures of information asymmetry, rather than the original definition, community orientation? First, as defined by Proenca, Rosko, and Zinn (200), community orientation is the generation, dissemination, and use of "community intelligence" - health service need and quality information. Intelligence and its distribution across participants to a negotiation is the core element of information asymmetry. Next, only selected items from the "community orientation" section are used. The questions selected pertain to service demand, quality, and cost information, which match the components of information asymmetry in the literature review. The five questions selected as proxies for information asymmetry are as follows (item number from the AHA survey in parentheses):

- Does the hospital work with other providers, public agencies or community representatives to conduct a health status assessment of the community? (D.4.)
- Does your hospital use health status indicators to design new services or modify existing services? (D.5.)
- Does your hospital work with other local providers, public agencies, or community representatives to develop a written assessment of the appropriate capacity for health services in the community? (D.6.a.)
- Does the hospital work with other providers to collect, track and communicate clinical and health information across cooperating organizations? (D.7.)
- Does the hospital, alone or with others, disseminate reports to the community on the quality and costs of health care services? (D.8.)

The information asymmetry variable is the sum of the preceding five measures and defined on a continuous scale of 0 to 5 where 0 indicates minimal information asymmetry and 5

presents a maximum information asymmetry. The scale shows acceptable reliability/internal consistency (Cronbach's alpha = 0.76)[1] and is considered as an information sharing and acquisition attitude in a hospital and as an IA proxy, based on normative expectations and empirical evidence in which information sharing and acquisition reduces information asymmetry (Kim and Verrecchia, 1991; Li and Balachandran, 1997; Bernardo and Judd, 2000).

Other Related Factors

All analyses control for profit versus not-for-profit status of the hospital. Theoretically, nonprofit organizations, due to attenuation of property interests, provide better quality of service than do the for-profits when asymmetric information exists. To examine how ownership status under asymmetric information affects the quality of care, Chou (2002) used mortality as a measure for quality of care in nursing home. Nonprofit nursing homes were found to be superior in mortality and other adverse health outcomes when the residents had asymmetric information. Another empirical study reported that, in the presence of asymmetric information, non-governmental organizations have the institutional capacity to deliver high quality health care (Leonard, 2002). Nonprofit hospitals may provide protection against asymmetric information relative to their for-profit counterparts (Mark, 1999). Profit or not for profit status is strongly associated with hospital profitability, regardless of information asymmetry conditions (Younis et al., 2003; Horwitz, 2005; Chakravarty et al., 2006).

Other characteristics of the hospital and community are held equal in multivariate analysis. Bed size is held constant, as a positive relationship between bed size and hospital profitability had been identified (Kim et al., 2002). Location (rural versus urban county) is used

[1] Cronbach's alpha is a measure of the internal consistency of a scale, that is, of the degree to which all items are inter-correlated and thus appear to be addressing the same underlying concept. Values above 0.7 are generally considered acceptable (Bland and Altman, 1997).

because most rural hospitals do not experience direct local competition (Asubonteng Rivers and Bae, 1999). Additional hospital characteristics include service type, physician payment arrangements, number of staff physicians, insurance products accepted, and whether the hospital is independent or part of a larger group of hospitals (Younis et al., 2003; Younis and Forgione, 2005). All measures are drawn from the AHA data set, limiting the analysis to categories rather than absolute values for certain variables (bed size, MSA size). In addition, we categorized number of staff physicians, as the raw distribution was considerably skewed, to improve normality and reduce the potential for systematic bias in multiple regression analyses (Osbourne and Waters, 2002). Community and market factors in the analysis include size of the community in which the hospital is located, whether the hospital falls in a state with community benefit laws, and whether the hospital experiences significant competition in its market. Competition was coded "high" if two or more hospitals were located within the same Zip Code; otherwise, "low." HMO penetration rate was added in the models to better characterize hospital markets.

Statistical Analysis

The SAS statistical package was used to analyze the data and recode variables if necessary. All tests used in the study were based on an alpha value of 0.05. Three statistical procedures were followed: univariate, bivariate analysis, and multivariate regression analysis.

RESULTS

Description of Study Sample

The original number of IMPM hospitals in the sample was 3,162. Outliers were identified using the cutpoint -300% profit margin (n = 19). After deletion of outliers, 3,143 observations remained and the profit range was -291.3% to 67.5%.

Of the 3,143 PPS hospitals, more than two thirds (77.9%) were JCAHO accredited, and about one in six (16.7%) had a medical school affiliation. PPS hospitals were most frequently non-profit (87.75%), general hospitals (98.6%), located in a metropolitan area (51.6%), and averaged 168 beds (Mean=168.4, SD= 175.4) and 14 full-time equivalent staff physicians (Mean=13.5, SD=60.2). Most were located in areas with low competition (79.2%) and without community benefits laws (62.0%). The average HMO penetration rate was 19.0%.

The mean information asymmetry score of PPS hospitals was not high. The most common information asymmetry score was 0, indicating the maximum amount of information sharing. This score was recorded by 46.0% of hospitals (1,445). Only 5.47% of the hospitals received the highest information asymmetry score, 5. The mean was 1.24, ranging from 0 to 5, with standard deviation 1.51.

Medicare profit margins showed a skewed distribution with a mean of 2.27%, range -291.3% to 67.5%, and standard deviation of 23.37. Most PPS hospitals (77.06%) reported having a long-term plan for improving the health of their communities.

Hospital and Market Characteristics and Information Asymmetry

In bivariate analysis, each of the twelve control variables for hospital and market characteristics was associated with significant mean differences in information asymmetry ($P<0.0001$ for all hospital characteristics; $P=0.0039$ for market competition; $P=0.0247$ for community benefits laws; $P<0.0001$ for HMO penetration rate). On the whole, higher information asymmetry was associated with hospitals that are for-profit, specialty treatment, located in rural areas and in low competitive and low HMO-penetration markets without community benefits laws, small scale, and independent (Table 1).

Hypothesis Testing

Testing for effects on profit margins and the presence of a long-term plan used a dichotomized measure of information asymmetry. When dichotomized, information asymmetry was expressed as low (scale values 0~3) versus high (scale values of 4 and 5). First, the effect of information asymmetry on Medicare profit margins was tested (Table 2). In multivariate analysis, there was a significant mean difference in Medicare profit margins, 1.85% versus 4.99%, between hospitals reporting low and high information asymmetry respectively (GLM test, P= 0.0192). On average, a high IA hospital will have 2.7 times the Medicare profit margins of a low IA hospital. This result supports the hypothesis that information asymmetry is associated with increased profit margins.

The second hypothesis was that high information asymmetry would be negatively associated with the likelihood that a hospital would report having a long-term plan for the health of its community. After controlling for all other variables in the model, information asymmetry was a significant predictor of failure to report a long-term plan (Logistic regression, P<0.0001; Table 3). For each 1-point increase in the information asymmetry score, the chance of reporting no long-term plan increased by 2.08 times, when holding constant the other variables in the model. This matches the hypothesis.

Finally, it was hypothesized that management at institutions with high information asymmetry would display potential performance tilting. Performance tilting, defined as 2000 Medicare profits in the top quartile simultaneous with the absence of a long term plan for the institution, was present in 5.57% of the hospitals. Performance tilting was most common among hospitals that are for-profit, for specialty treatment, in areas that are either rural or with 500,000 to 1,000,000 population, small scale, and independent (P<0.05). The results of logistic regression (Table 4) indicate that, after controlling for all other variables in the model, information

asymmetry was a significant predictor of performance tilting (P<0.0001). Hospitals that have increased information asymmetry were significantly associated with an increased likelihood of reporting performance tilting. The results support the performance tilting hypothesis.

DISCUSSION

Information Asymmetry

Overall, hospital information asymmetry as measured in our study was not high, with only a small proportion of PPS hospitals (11.07%) reporting the highest level of information asymmetry. Not-for-profit hospitals still dominate in the hospital sector. As discussed earlier, nonprofit organizations may provide better quality and lower price of service than for-profits, and may be less subject to competitive motivation (Chillemi and Gui, 1991; Mark, 1999; Chou, 2002; Horwitz, 2005; Chakravarty et al., 2006). In addition, managed care (HMO) penetration, market competition, and the regulatory actions of public insurers (Medicaid, Medicare) may contribute to the reduction of information asymmetry in hospitals (Jin, 2003). Thus, a low level of information asymmetry across the whole market is not surprising.

For-profit hospitals were found to have a higher level of information asymmetry than non-profit hospitals in bivariate analysis (Table 1). Specialty hospitals contain higher percentage of for-profit hospitals than does the universe of studied hospitals (45.83% versus 12.25%), which may explain why specialty hospitals have higher information asymmetry.

Market competition is known to reduce information asymmetry in HMOs (Jin, 2003). Thus, it was not surprising to find that information asymmetry was higher for hospitals in low competition than high competition markets, and in states without community benefit laws than where such laws are present. The negative relationship between HMO penetration rate and

information asymmetry (Table 1) suggests that local market competition may alleviate information asymmetry, since hospitals voluntarily disclose quality information to differentiate themselves from competitors (Jin, 2003). Effect sizes for competition and community benefit laws were not large, suggesting that other influences also affect information disclosure. Management strategy can be a determinant of information asymmetry (Proenca et al., 2000; Tan et al., 2003); hospital management may elect to withhold information compared to peer institutions in the same market (Boyer et al., 2003).

In addition to for-profit hospitals, small hospitals, independent hospitals and rural hospitals tended to have higher information asymmetry than their counterparts, large hospitals, chain hospitals and urban hospitals. Small and rural hospitals, and possibly independent facilities, may lack the financial and human resources needed for information acquisition and sharing. The information development activities associated with quality assessment and community planning place a burden on the hospital in terms of analytic personnel and expertise. Smaller institutions may lack the internal infrastructure to use information effectively, and further lack the personnel resources to participate in community-level planning activities. The latter draw resources from the hospital's core function of individual patient care, which smaller institutions may be unable to spare. Rural hospital positions with regard to information sharing may be driven by size, as such institutions are generally smaller than their urban peers. However, the smallest rural facilities, critical access hospitals, were excluded from this analysis. It is therefore possible that the principal determinant of information asymmetry among rural hospitals is lack of competition.

Information Asymmetry Effects and Relationships

Consistent with theory, hospitals that take a high information asymmetry stance with regard to their community had higher profit margins than did hospitals with lower levels of

information asymmetry, hospital characteristics held equal (Table 2). The effect size was similar to that for profit versus non-profit status, also present in the model. Two market characteristics associated with information asymmetry, competition and community benefits laws, were not significantly associated with profit margin when information asymmetry was also in the model. HMO penetration rate, on the other hand, was positively correlated with profit margin. In high HMO-penetrated areas, hospitals may tend to adopt the product differentiation strategy to cope with competition and reach higher profitability (Jin, 2003). Since overall hospital profitability was proved to decline as a result of the reduced reimbursement in the Balanced Budget Act (Younis, 2006), the profit motive of hospital and its potential causes and effects merit more attention.

Second, hospitals engaging in high information asymmetry were more likely to report having no long term plan for improving the health of the community (Table 3). Since development of a community health plan involves working and information sharing with other organizations, an inverse relationship between information asymmetry and a long term plan for community health is logical. The absence of effects for local competition, community benefits laws or HMO penetration rate, however, was surprising. Even though development of long-term community health plan could be considered as a transaction cost burden, hospitals might find it advantageous to voluntarily engage in such a practice to differentiate themselves in competitive markets, build reputation, and discreetly advertise (Spence, 1973; Serour and Dickens, 2004). However, market features were not found to be significant when management aversion to information sharing, as manifested in information asymmetry, is modeled.

Most importantly, the research found that when information asymmetry becomes higher, hospitals were more likely to engage in performance tilting, defined as high profits coincident

with the absence of a plan for community health. Maximizing the institution's current Medicare profits, while failing to build a long-term plan for improving people's health, appears to co-occur with information asymmetry and may reflect a similar managerial focus on addressing short-term issues. For-profit status was also associated with an increased likelihood of performance tilting, even with the higher rates of information asymmetry at for-profit hospitals held constant. JCAHO accredited hospitals were less likely than non-accredited hospitals to engage in performance tilting. Market characteristics were not significantly related to performance tilting.

Limitations

There are multiple limitations to the present research which need to be addressed. First, two of the dependent variables, information asymmetry and performance tilting, were measured using self-report data from the AHA annual survey, and thus are subject to respondent bias. This could attenuate the results. Second, because revenue data are considered confidential and are not released publicly at the hospital level, Medicare profit margins were chosen to serve as the profitability indicator in this study. The study assumes that there is no significant difference between the effects of information asymmetry on Medicare profit margins and its effects on other related measures of profitability. Third, missing values and lost data as a result of merging can weaken the statistical testing power. It is possible that the relationship between information asymmetry and the variables examined in this research were different at the 31.72% of hospitals for which the two data files could not be matched. Finally and most importantly, all analyses were cross-sectional. Therefore, it is impossible to determine a temporal or causal relationship between information asymmetry and its effects from the analysis. It is important that future research examine the relationships between information asymmetry and time-lagged outcomes,

to distinguish between information asymmetry as a response to existing conditions and information asymmetry as input into the development of future financial outcomes.

Policy Implications

The effects of information asymmetry are difficult to address through policy, and performance tilting poses an even more intractable problem. Health care report cards, addressing the informational asymmetry problem in health care markets, give health care providers perverse incentives: to decline more difficult, severely ill patients (Dranove et al., 2003). The evidence regarding consumer use of such information is mixed. Health plan report cards have been found to influence consumer selection of insurers (Scanlon et al., 2002). However, acutely ill patients have been found to be generally unaware of quality reporting, and often have few alternatives available to them (Schneider and Epstein, 1998; Marshall et al., 2000) Further, even when conditions are less inherently constrained by time and illness—consumer search for nursing home rather than hospital care—consumers are not necessarily interested in accessing such information (Castle, 2003). Whether increased information demands from a society accustomed to significant data availability will reduce agency problems in healthcare management is unclear. An information-rich society will probably continue to expect, and in some cases demand through regulation, increased disclosure from hospitals and other healthcare providers. The best form of such disclosure, and its content from patient safety (Small and Barach, 2002) through financial accounting (Peregrine and Schwartz, 2002; Valletta, 2005), are likely to be debated through the next decade. Policies aimed at mandatory information disclosure may only proceed as effective, comparable performance metrics are developed (Eggleston, 2005) and as the population is educated to use them.

The performance tilting problem has been more commonly documented among management personnel in industry (Guilding et al., 2005; Khaleghian and Gupta, 2005). With high CEO turnover and short CEO tenure in hospitals (Evans, 2006; Khaliq et al., 2006), however, the temptation to enhance short-term managerial performance cannot be discounted. Hospital Boards of Directors should be sensitive to the possibility of principal-agent performance manipulation when extreme information asymmetry levels and higher-than-average profitability are present simultaneously. The long-term integration of the hospital into the community may be experiencing neglect to ensure that present goals are met. Given the pressure of community benefit laws non-profit hospital boards should be particularly attentive to the implications of potential excess hospital earnings for the institution's long-term tax status. Board assessments of hospital CEO performance which address performance on community health measures have been found to be related to increased engagement of the hospital with the community (Alexander et al., 2008). Thus, balanced measures of performance may be one means for addressing the problem of performance tilting.

Conclusion

The current study proceeds from the assumption that asymmetric information gives hospitals an informational advantage over the consumer and market power to direct health service use. This leads to higher profitability, and creates the possibility of performance tilting. Adopting a proxy measure for information asymmetry, this study has empirically demonstrated that hospitals, like traditional businesses, can engage in profit maximization and performance tilting behaviors. Since Zeckhauser and Pound first proposed the performance tilting issue in

1990 [36], there has not been a nationwide empirical examination of performance tilting in the health care sector. The present research establishes a baseline for future studies on the issue.

As Zeckhauser and Pound suggested, management will have an incentive to tilt earnings toward the present when information asymmetry is present, although outside monitors on both "A" and "B" can ameliorate this distortion. In the hospital case, hospital executives will seek to demonstrate to patients and other stakeholders that they are operating effectively by fostering immediate profit at the expense of developing a long-term plan for the institution and its role in the community's health. Hospital Boards of Directors should ideally serve as the outside monitors referenced by Zeckhauser and Pound.

The findings of our study partially support the agent theory and transactional cost analysis. Under the uncertainty condition in which information search is costly, uninformed patients who lack a mechanism to discern health service quality have to rely on delegating health services to health care providers as their (imperfect) agents. In delivering health care, hospitals may conceal quality and cost information and may not communicate health information to specify what would constitute appropriate provision for need of care relative to patients, because information sharing and acquisition is a transaction cost in which some hospitals may not choose to invest. Asymmetric information leaves open the possibility of the tilting and profit-maximizing provider behavior on the part of the hospital and the physician. Since asymmetry in information as a cost, an advantage, and even a marketing tactic has an impact on the effectiveness of resource allocation in the health service market, its implications for delivering better health care and enhancing patient benefits are profound.

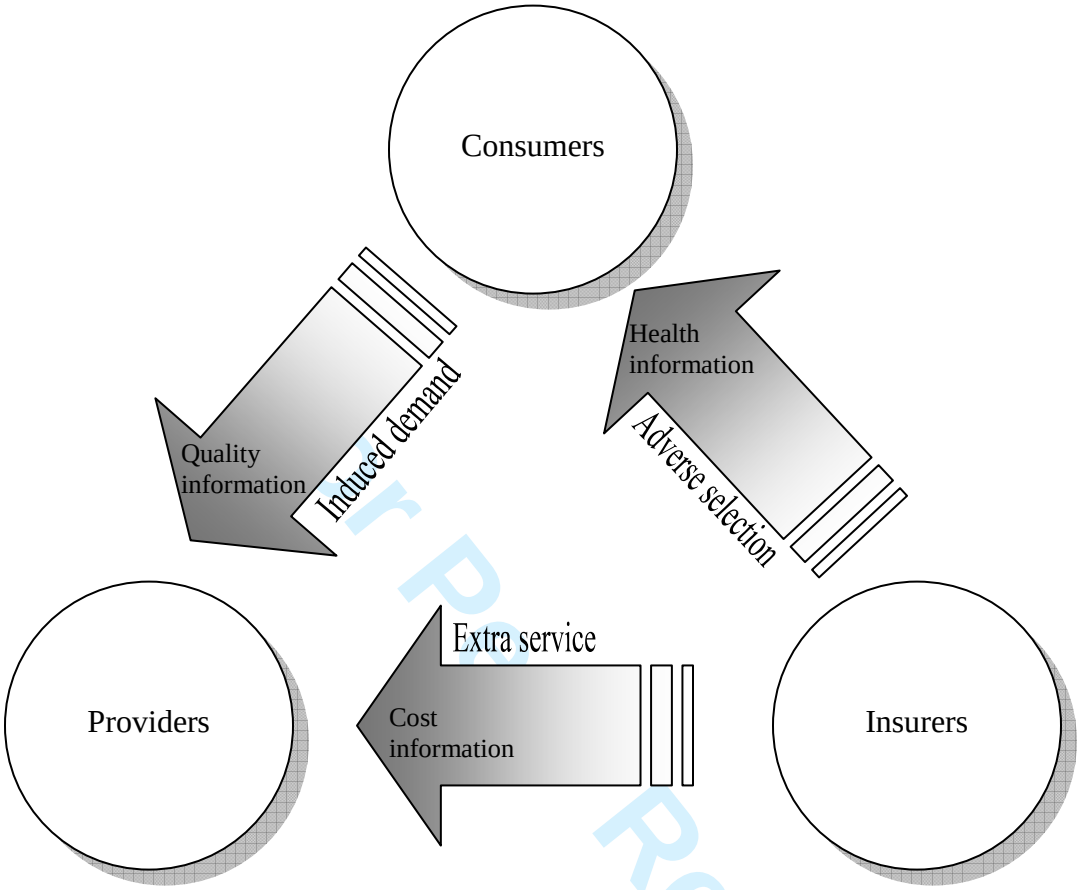

Figure 1. A Model of the Mechanism between Three Participants of Health Care Services (Mooney, 1994; Nichols, 1998) and the Relative Distributions of the Amount of Information

Table 1. Mean Information Asymmetry Scores by Hospital and Market Characteristics (GLM Test, N=3,143)

Variables	N	DF	Information asymmetry			
			Sum of squares	LSMean	F value	P value
Accreditation		2	547.58		129.91	<.0001
No accreditation	683			1.9883		
Only JCAHO	1935			1.1106		
Only medical school affiliation or both JCAHO and medical school affiliation	525			0.7371		
Profit/Non-profit		1	54.75		24.19	<.0001
Profit	385			1.5922		
Non-profit	2758			1.1896		
Service type		2	77.58		17.18	<.0001
General medical and surgical	3098			1.2221		
Other specialty treatment	24			2.9583		
Other	21			1.7619		
MSA size		6	265.56		20.12	<.0001
Non metropolitan area	1520			1.5211		
Under 100,000 population	31			0.7097		
100,000 to 250,000 population	246			1.2236		
250,000 to 500,000 population	262			0.9237		
500,000 to 1,000,000 population	250			1.0440		
1,000,000 to 2,500,000 population	405			0.8049		
Over 2,500,000	429			1.0023		
Bed size		7	513.80		34.59	<.0001
6-24 beds	158			2.2278		
25-49 beds	575			1.6835		
50-99 beds	679			1.4212		
100-199 beds	831			1.1071		
200-299 beds	419			0.7948		
300-399 beds	213			0.8685		
400-499 beds	111			0.6396		
500 or more beds	157			0.6369		
Physician arrangements		9	307.81		15.63	<.0001
Independent practice association	266			1.4624		
Group practice without	43			1.3953		

walls						
Open physician-hospital organization	356			1.1348		
Closed physician-hospital organization	101			1.0891		
Management service organization	94			1.2766		
Integrated salary model	424			1.2712		
Equity model	12			1.1667		
Foundation	44			0.8636		
Multiple arrangements	817			0.7980		
Not assigned	986			1.5903		
Insurance products		4	189.47		21.31	<.0001
Health maintenance organization	197			0.7716		
Preferred provider organization	317			1.1293		
Indemnity fee for service plan	15			1.2000		
Multiple products	518			0.8282		
Not assigned	2096			1.4012		
Health system cluster[1]		5	149.67		13.38	<.0001
Centralized health system	155			0.4516		
Centralized physician/insurance health system	170			1.0706		
Moderately centralized health system	485			1.1113		
Decentralized health system	684			1.2573		
Independent hospital system	61			1.8689		
Not assigned	1588			1.3407		
Staffed physicians		3	213.56		32.14	<.0001
0 physician	1351			1.3871		
1 physician	281			1.5872		
2-7 physicians	757			1.2867		
> 7 physicians	754			0.7958		
Competition[2]		1	19.03		8.36	0.0039
High competition	654			1.0872		
Low competition	2489			1.2788		
Community Benefits Laws		1	11.51		5.05	0.0247
Present[3]	1194			1.1616		
Absent	1949			1.2863		
HMO Penetration Rate[4]						<.0001

Note: [1] This new classification system was developed by the AHA's Health Research and Educational Trust and Health Forum, and the University of California-Berkeley (Bazzoli et al, 1999).

[2] Competition was coded high if two or more hospitals were located within the same area of a zip code; otherwise, low.

[3] CA, CT, GA, ID, IN, MA, MN, NH, NY, PA, RI, TX, UT, WV.

[4] Pearson correlation coefficient=-0.1859.

Table 2. Effect of Information Asymmetry on Medicare Profit Margins, Controlling for Hospital and Market Characteristics (Multiple Regression, N=3,143)

Variables	Medicare profit margins			
	Regression Coefficient	SE	T value	P value
Intercept	10.77456	3.42960	3.14	0.0017
Information asymmetry (low versus high)	3.15260	1.34564	2.34	0.0192
Accreditation				
No accreditation§				
Only JCAHO	-2.92750	1.19537	-2.45	0.0144
Only medical school affiliation	1.08128	1.80620	0.60	0.5495
or both JCAHO and medical school affiliation				
Non-profit/Profit	8.16966	1.41816	5.76	<.0001
Service type				
General medical and surgical§				
Other specialty treatment	9.14927	4.78167	1.91	0.0558
Other	0.22148	5.14545	0.04	0.9657
MSA size				
Non metropolitan area	-1.94681	1.70513	-1.14	0.2537
Under 100,000 population	-5.13358	4.31045	-1.19	0.2338
100,000 to 250,000 population	-5.31045	1.91511	-2.77	0.0056
250,000 to 500,000 population	-4.30648	1.82676	-2.36	0.0185
500,000 to 1,000,000 population	-4.49300	1.83842	-2.44	0.0146
1,000,000 to 2,500,000 population	-3.91826	1.62177	-2.42	0.0157
Over 2,500,000§				
Bed size				
6-24 beds	-18.91770	3.05509	-6.19	<.0001
25-49 beds	-11.70232	2.56264	-4.57	<.0001
50-99 beds	-8.86743	2.45927	-3.61	0.0003
100-199 beds	-6.06410	2.29903	-2.64	0.0084
200-299 beds	-4.23898	2.27690	-1.86	0.0627
300-399 beds	-4.72159	2.47179	-1.91	0.0562
400-499 beds	-0.82186	2.84417	-0.29	0.7726
500 or more beds§				
Physician arrangements				
Independent practice association	3.41525	1.65879	2.06	0.0396
Group practice without walls	0.91514	3.57371	0.26	0.7979
Open physician-hospital organization	2.06813	1.48615	1.39	0.1641
Closed physician-hospital organization	0.20065	2.40003	0.08	0.9334
Management service organization	1.33633	2.48207	0.54	0.5903

Integrated salary model	0.09545	1.42354	0.07	0.9465
Equity model	-3.48593	6.57285	-0.53	0.5959
Foundation	2.70756	3.52800	0.77	0.4429
Multiple arrangements§				
Not assigned	-0.71458	1.20245	-0.59	0.5524
Insurance products				
Health maintenance organization	2.28178	1.94442	1.17	0.2407
Preferred provider organization	-1.30171	1.64781	-0.79	0.4296
Indemnity fee for service plan	9.87808	6.16031	1.60	0.1089
Multiple products§				
Not assigned	-0.03969	1.24532	-0.03	0.9746
Health system cluster				
Centralized health system§				
Centralized physician/insurance health System	0.64792	2.59219	0.25	0.8026
Moderately centralized health system	-1.88795	2.18329	-0.86	0.3873
Decentralized health system	-2.03565	2.13990	-0.95	0.3415
Independent hospital system	-5.48964	3.56093	-1.54	0.1233
Not assigned	-3.22829	2.04146	-1.58	0.1139
Staffed physicians				
0 physician§				
1 physician	-1.67968	1.50042	-1.12	0.2630
2-7 physicians	4.03183	1.07104	3.76	0.0002
> 7 physicians	3.32881	1.20871	2.75	0.0059
Competition	-0.01685	1.10482	-0.02	0.9878
Community Benefits Laws	1.53972	0.89273	1.72	0.0847
HMO Penetration Rate	8.48546	3.58171	2.37	0.0179

Note: 1. R-Square=.09, DF=43, F=7.40, P<.0001
Note: 2. § Reference category
Note: 3. Information asymmetry in a scale of 0~5 was not significant (P=0.0654)

Table 3. Relationship between Information Asymmetry and the Likelihood that a Hospital Will Report Having No Long-Term Plan for Community Health, Controlling for Hospital and Market Characteristics (Logistic Regression, N=3,143)

Variables	Long-term plan				
	Regression Coefficient	SE	Odds ratio	95% CL	P value
Intercept	-3.8000	0.6276			<.0001
Information asymmetry (0~5)	0.7302	0.0352	2.076	1.937-2.224	<.0001
Accreditation					
No accreditation§					
Only JCAHO	-0.6076	0.1354	0.545	0.418-0.710	<.0001
Only medical school affiliation or both JCAHO and medical school affiliation	-0.5368	0.2386	0.585	0.366-0.933	0.0245
Non-profit/Profit	0.1627	0.1771	1.177	0.832-1.665	0.3584
Service type					
General medical and surgical§					
Other specialty treatment	1.0992	0.6062	3.002	0.915-9.849	0.0698
Other	-0.0167	0.6250	0.983	0.289-3.348	0.9787
MSA size					
Non metropolitan area	0.2683	0.2319	1.308	0.830-2.060	0.2473
Under 100,000 population	0.7010	0.5614	2.016	0.671-6.057	0.2118
100,000 to 250,000 population	0.2037	0.2627	1.226	0.732-2.052	0.4383
250,000 to 500,000 population	0.3043	0.2590	1.356	0.816-2.252	0.2399
500,000 to 1,000,000 population	0.7206	0.2473	2.056	1.266-3.337	0.0036
1,000,000 to 2,500,000 population	-0.0933	0.2527	0.911	0.555-1.495	0.7118
Over 2,500,000§					
Bed size					
6-24 beds	1.2418	0.4217	3.462	1.515-7.911	0.0032
25-49 beds	0.5033	0.3845	1.654	0.778-3.515	0.1906
50-99 beds	0.3299	0.3764	1.391	0.665-2.909	0.3808
100-199 beds	0.0640	0.3630	1.066	0.523-2.172	0.8600
200-299 beds	0.0875	0.3653	1.091	0.533-2.233	0.8107
300-399 beds	-0.1096	0.4029	0.896	0.407-1.974	0.7857
400-499 beds	0.2922	0.4502	1.339	0.554-3.237	0.5162
500 or more beds§					
Physician arrangements					
Independent practice association	0.1390	0.2164	1.149	0.752-1.756	0.5206
Group practice without walls	-0.3904	0.4490	0.677	0.281-1.632	0.3846
Open physician-hospital organization	0.2068	0.1983	1.230	0.834-1.814	0.2971
Closed physician-hospital organization	0.2060	0.3160	1.229	0.661-2.283	0.5145
Management service organization	-0.5195	0.3656	0.595	0.291-1.218	0.1553
Integrated salary model	0.2391	0.1853	1.270	0.883-1.826	0.1970
Equity model	-0.5819	0.9160	0.559	0.093-3.365	0.5253

Foundation	-0.6308	0.5900	0.532	0.167-1.692	0.2850
Multiple arrangements[§]					
Not assigned	0.0919	0.1602	1.096	0.801-1.501	0.5662
Insurance products					
Health maintenance organization	0.1247	0.3002	1.133	0.629-2.040	0.6780
Preferred provider organization	-0.0589	0.2388	0.943	0.590-1.505	0.8052
Indemnity fee for service plan	-0.0695	0.8414	0.933	0.179-4.853	0.9342
Multiple products[§]					
Not assigned	0.3911	0.1804	1.479	1.038-2.106	0.0302
Health system cluster					
Centralized health system[§]					
Centralized physician/insurance health system	0.5670	0.5243	1.763	0.631-4.926	0.2794
Moderately centralized health system	0.9048	0.4750	2.471	0.974-6.269	0.0568
Decentralized health system	0.8203	0.4685	2.271	0.907-5.689	0.0800
Independent hospital system	0.8106	0.5797	2.249	0.722-7.006	0.1620
Not assigned	1.1770	0.4597	3.245	1.318-7.988	0.0105
Staffed physicians					
0 physician[§]					
1 physician	-0.2165	0.1839	0.805	0.562-1.155	0.2391
2-7 physicians	-0.1891	0.1358	0.828	0.634-1.080	0.1637
> 7 physicians	-0.0969	0.1669	0.908	0.654-1.259	0.5614
Competition	0.0103	0.1529	1.010	0.749-1.363	0.9462
Community Benefits Laws	-0.2196	0.1162	0.803	0.639-1.008	0.0588
HMO Penetration Rate	0.4212	0.4704	1.524	0.606-3.831	0.3705

Note: 1. Probability modeled is long-term plan=0
Note: 2. Likelihood ratio Chi-Square=963.71, DF=43, P<.0001
Note: 3. [§] Reference category
Note: 4. Dichotomized information asymmetry (low vs. high) was also significant (P<.0001)

Table 4. Relationship between Information Asymmetry and the Likelihood that a Hospital Will Display Performance Tilting, Controlling for Hospital and Market Characteristics (Logistic Regression, N=3,143)

Variables	Performance tilting				
	Regression Coefficient	SE	Odds ratio	95% CL	P value
Intercept	-7.3642	1.5404			<.0001
Information asymmetry (0~5)	0.5968	0.0529	1.816	1.637-2.015	<.0001
Accreditation					
No accreditation§					
Only JCAHO	-0.7139	0.2281	0.490	0.313-0.766	0.0018
Only medical school affiliation or both JCAHO and medical school affiliation	-0.3625	0.3956	0.696	0.321-1.511	0.3594
Non-profit/Profit	0.7751	0.2724	2.171	1.273-3.703	0.0044
Service type					
General medical and surgical§					
Other specialty treatment	0.2620	0.6145	1.299	0.390-4.333	0.6699
Other	0.5857	0.7859	1.796	0.385-8.381	0.4561
MSA size					
Non metropolitan area	-0.0625	0.3646	0.939	0.460-1.920	0.8640
Under 100,000 population	-13.4665	1049.8	<0.001	0.001-999.9	0.9898
100,000 to 250,000 population	-0.7999	0.4830	0.449	0.174-1.158	0.0977
250,000 to 500,000 population	-0.0249	0.4166	0.975	0.431-2.207	0.9524
500,000 to 1,000,000 population	0.2436	0.3796	1.276	0.606-2.685	0.5210
1,000,000 to 2,500,000 population	-0.4260	0.4087	0.653	0.293-1.455	0.2972
Over 2,500,000§					
Bed size					
6-24 beds	2.1203	1.1129	8.334	0.941-73.82	0.0567
25-49 beds	1.7979	1.0953	6.037	0.706-51.66	0.1007
50-99 beds	1.5114	1.0926	4.533	0.533-38.59	0.1666
100-199 beds	1.5569	1.0764	4.744	0.575-39.12	0.1481
200-299 beds	1.4921	1.0832	4.447	0.532-37.16	0.1684
300-399 beds	1.8921	1.0892	6.633	0.785-56.08	0.0823
400-499 beds	2.6059	1.1048	13.544	1.553-118.1	0.0183
500 or more beds§					
Physician arrangements					
Independent practice association	0.5755	0.3534	1.778	0.889-3.555	0.1035
Group practice without walls	-14.5016	825.6	<0.001	0.001-999.9	0.9860
Open physician-hospital organization	0.4432	0.3640	1.558	0.763-3.179	0.2234
Closed physician-hospital organization	0.7058	0.5111	2.026	0.744-5.516	0.1673
Management service organization	0.0648	0.5897	1.067	0.336-3.389	0.9125
Integrated salary model	0.4555	0.3246	1.577	0.835-2.979	0.1605

Equity model	-14.2739	1527.3	<0.001	0.001-999.9	0.9925
Foundation	-13.9669	854.4	<0.001	0.001-999.9	0.9870
Multiple arrangements[§]					
Not assigned	0.2349	0.2972	1.265	0.706-2.265	0.4292
Insurance products					
Health maintenance organization	1.1021	0.4782	3.011	1.179-7.686	0.0212
Preferred provider organization	0.1172	0.4761	1.124	0.442-2.859	0.8056
Indemnity fee for service plan	2.0818	0.9100	8.019	1.347-47.72	0.0222
Multiple products[§]					
Not assigned	0.5914	0.3547	1.806	0.901-3.620	0.0955
Health system cluster					
Centralized health system[§]					
Centralized physician/insurance health system	0.8260	1.1361	2.284	0.246-21.17	0.4672
Moderately centralized health system	1.0091	1.0479	2.743	0.352-21.39	0.3356
Decentralized health system	0.7653	1.0446	2.150	0.277-16.66	0.4638
Independent hospital system	0.5228	1.1695	1.687	0.170-16.69	0.6548
Not assigned	1.0831	1.0338	2.954	0.389-22.41	0.2948
Staffed physicians					
0 physician[§]					
1 physician	-0.4317	0.3287	0.649	0.341-1.237	0.1890
2-7 physicians	0.3942	0.2176	1.483	0.968-2.272	0.0701
> 7 physicians	0.3928	0.2873	1.481	0.843-2.601	0.1716
Competition	-0.5518	0.2834	0.576	0.330-1.004	0.0515
Community Benefits Laws	0.0670	0.1944	1.069	0.730-1.565	0.7305
HMO Penetration Rate	1.1842	0.7900	3.268	0.695-15.37	0.1339

Note: 1. Probability modeled is performance tilting positive (0)
Note: 2. Likelihood ratio Chi-Square=292.63, DF=43, P<.0001
Note: 3. [§] Reference category
Note: 4. Dichotomized information asymmetry (low vs. high) was also significant (P<.0001)

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